The March 2003 issue of dcluINFO *featured BuiltGreen™, the residential environmental building program supported by the City of Seattle. This month's feature explores a natural systems approach to stormwater management.*

case study

stormwater management

using stormwater as a resource

A look at alternative methods for flow and drainage control

Recognizing that water is a defining element in our local ecosystem, the City of Seattle has several projects underway that celebrate water in the public realm. These endeavors are designed to reconnect our community to the natural water cycle and to use alternative methods of flow and drainage control to preserve our resources.

Open Space Strategy Connects Two Watersheds

CityDesign, the urban design center within DPD, is creating an open space strategy for the Center City called "The Blue Ring: Connecting Places." One of The Blue Ring's goals is to create an urban flow of people and water that responds to the Center City's two watersheds—Lake Union and Middle Puget Sound.

One project included in The Blue Ring is Westlake Gardens, which is located along Westlake Avenue south from Denny Avenue. Westlake Gardens will demonstrate stormwater strategies that integrate landscape and architecture to slow the flow and reveal water by using elements like ecoroofs; architectural downspouts, siding and cascades; cisterns; and streams, ponds, and wetlands.

> "The City of Seattle has several projects underway that celebrate water in the public realm, using alternative methods of flow and drainage control."
>
> *—Lynne Barker*
> *Sustainable Building Specialist, DPD*

Civic Campus Will Save Over a Billion Gallons of Water Annually

Seattle's new Civic Campus open space design will evoke the flow of water from the sky to the Puget Sound. The water is captured on rooftops and directed "downstream" through the building sites. Public plazas will be enlivened as water is brought to the surface in ponds, fountains and public art. A portion of the Seattle Justice Center rooftop mimics a natural landscape with a vegetated roof system, or green roof, to reduce the overall flow of stormwater. Soil and plants capture and store rainwater, and the rooftop garden serves as an amenity for the building occupants and visitors.

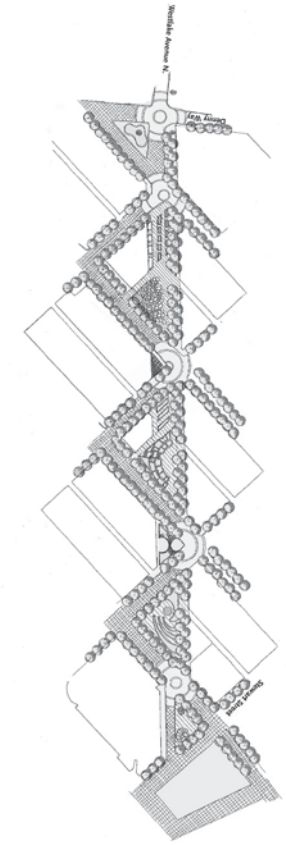


Illustration of Westlake Gardens, an element of the City's open space strategy which demonstrates sustainable design that integrates architecture and landscape to protect our urban watershed. Westlake Gardens is located along Westlake Avenue south of Denny Avenue.

Illustration by Lorna Jordan Studio

Seattle City Hall's stormwater collection system will save an estimated 987 million gallons of potable water each year, enough to supply 18 households.

Seattle's new City Hall will capture stormwater to meet non-potable water demand. The civil engineering firm worked with the project team to create an innovative solution to reduce the impact of stormwater on the municipal drainage system with the added benefit of reducing potable water demand for building operations. Stormwater will be stored in a cistern constructed from the basement of the old Municipal Building, and used for flushing toilets and irrigating the plaza landscape. (See item 1 on next page for additional details.)

Stormwater Management Will Help Achieve LEED™ Status

Many of the stormwater management strategies demonstrated on the Civic Campus project will assist the projects in achieving LEED™ criteria. LEED stands for Leadership in Energy and Environmental Design and is a green building standard developed by the US Green Building Council. LEED establishes performance criteria for managing stormwater during construction and through the life of a project, including:

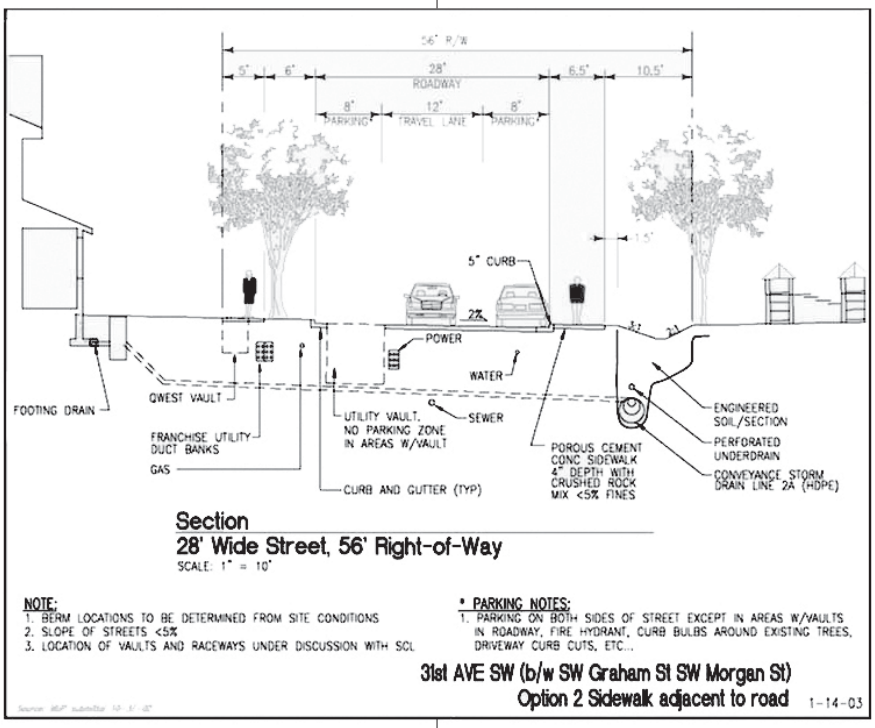
- Controlling erosion to reduce negative impacts on water and air quality. All projects are required to meet best management practices developed by the EPA for managing stormwater during construction, or local codes, whichever is more stringent. Seattle Public Utilities recently completed a comparative analysis of the EPA's best management practices and Seattle's Stormwater, Grading, and Drainage Control Code. The measure-by-measure comparison indicates that Seattle's code is either more stringent or equivalent to EPA measures. This evaluation is available in the "LEED-related tools" section at **www.seattle.gov/dpd/sustainability**.
- Limiting disruption of natural water flows by minimizing stormwater runoff, increasing on-site infiltration and reducing contaminants. This can be accomplished by infiltrating stormwater on-site where appropriate soil conditions exist, capturing stormwater for beneficial use, and treating stormwater to specified levels for removal of total suspended solids and total phosphorous.
- Limiting or eliminating the use of potable water for landscape irrigation. This can be accomplished by using captured rainwater, or stormwater, to meet some or all of the irrigation requirements.
- Reducing the generation of wastewater and potable water demand, while increasing local aquifer recharge. Stormwater can be captured and used to convey sewage through the municipal system.

"SEA Streets," located in Northwest Seattle, is a pilot alternative street design that promotes creek restoration by reducing stormwater leaving the street. The design combines hydraulic engineering with soil science and botany to create a more natural system.

Controlling Flow with Natural Systems

Alternative methods to conventional engineering can be used to meet flow control requirements. These methods combine natural systems with engineering and technology. Alternative strategies can extend the capacity of our stormwater drainage system by reducing peak flows of stormwater. They can also contribute to our efforts to restore urban ecology by improving water quality in local creeks, streams and water bodies, and creating habitat for wildlife and protecting salmon habitat.

Projects can meet requirements with strategies such as stormwater planters, bioengineered planting strips, and infiltration planters. Seattle's pilot Street Edge Alternative, "SEA Street," is an example of a bioengineered strategy that more closely mimics nature (see picture on page 2). Demonstrations of alternative strategies are being implemented at the building, block, neighborhood and watershed level, as described below.



Seattle Public Utilities is partnering with the Seattle Housing Authority to integrate natural drainage (as illustrated above) into High Point, a 129-acre, mixed-income housing development in the Longfellow Creek Watershed in West Seattle. Details on page 8.

Illustration by SvR Design Company

1. Building Level — As mentioned above, the design team for Seattle City Hall implemented strategies to reduce the impact of stormwater on the municipal drainage system and local watershed. Seattle City Hall will feature a stormwater collection system. The basement of the old Municipal Building will be renovated into a 24,000 cubic foot cistern that will hold up to 180,000 gallons of stormwater collected from the rooftop and plaza surfaces. The stormwater will be used for landscape irrigation and toilet flushing. The strategies will save an estimated 132,000 cubic feet, or 987 million gallons, of potable water annually—enough water to supply 18 households each year—and reduce stormwater, wastewater and potable water fees by $6,000 per year.

2. Block or Neighborhood Level — The Urban Environmental Institute prepared the "Resource Guide for Sustainable Development in an Urban Environment: A Case Study of South Lake Union." The project was sponsored by Vulcan, Inc. and identifies sustainable design and technology solutions that may be appropriate for South Lake Union. Many strategies used the comprehensive scale of neighborhood to reduce short and long-term impacts to urban development.

One recommendation is to increase permeable surfaces to allow stormwater to infiltrate, reduce runoff, increase groundwater recharge

and filter water before it reaches Lake Union. The study explores the impact of replacing parking lanes on Harrison and Thomas Streets and the entire road section of Terry Avenue with permeable surfaces, such as porous concrete – for a total surface area of 5.1 acres. The annual runoff from a 5.1 acre area could fill a one acre pond over 15 feet deep. Impervious surfaces reduction credits in DPD's 2000 Flow Control Technical Requirements Manual would apply to this approach.

While direct infiltration of large quantities of stormwater is not always possible or practical due to soil conditions and/or basements in some areas, porous pavements still offer many benefits in these areas for stormwater quality improvements and retention. In areas where clay soils or other restricting subsurface conditions exist, or concerns where basement/groundwater is an issue, the sub-base could be lined and directed to landscape areas.

3. Watershed Level — Seattle Public Utilities (SPU) has a number of demonstration projects underway that feature "natural drainage systems." These systems are designed to reduce the flow of stormwater into local creeks to reduce erosion and improve the water quality. The natural drainage systems are drainage capital improvement projects located in the public right-of-way, or streets and sidewalks. The systems feature a combination of elements with multiple functions, including: infiltration and slowing the flow of stormwater; filtering and bioremediation of pollutants by soils and plants; reducing impervious surfaces and incorporating porous paving; and increasing vegetation and other pedestrian amenities.

SPU is partnering with the Seattle Housing Authority to integrate a natural drainage system into the High Point development project—a 129-acre, mixed-income housing redevelopment located in the Longfellow Creek Watershed in West Seattle.

The natural system design proposes to integrate 22,000 lineal feet of vegetated and grassy swales throughout the development within the planting strip of the right-of-way. These swales include sub-surface engineered soil to provide storage and infiltration. Each swale is designed to treat the runoff from the road and housing of the adjacent block. At a system scale, the natural systems combined with a pond at the north end of the site will provide water quality treatment for the six-month storm and attenuate the two-year storm to pre-developed pasture conditions to enhance the stream flows in Longfellow Creek. This distributed block-scale system provides much greater opportunity to cleanse, cool and infiltrate stormwater runoff than the traditional piped and centralized management approach.

How to Pursue Alternative Stormwater Management Practices

If you are interested in pursuing alternative methods of stormwater management, be sure to contact DPD's Side Sewer Team early in your pre-design process. Side Sewer staff are located on the 20th floor of Seattle Municipal Tower at 700 Fifth Ave. in downtown Seattle, (206) 684-8860. The Side Sewer web address is *www.seattle.gov/dpd/sidesewer*.

"Alternative flow control methods can extend public drainage system capacity, improve local water quality, and protect habitat."

—Ken Watanabe
Site Development Supervisor, DPD

Additional Resources

For more information on Seattle's Stormwater, Grading, and Drainage Control Code, visit DPD's Side Sewer Program website at *www.seattle.gov/dpd/sidesewer*, or contact the Side Sewer Counter, located on the 20th floor of Seattle Municipal Tower at 700 Fifth Ave., in downtown Seattle, (206) 684-8860.

To learn more about natural drainage, including "SEA Streets," visit Seattle Public Utilities' Natural Drainage website at *www.seattle.gov/util/naturalsystems*.

To learn more about Seattle's Sustainable Building Program, visit its website at *www.seattle.gov/dpd/sustainability*.

See what DPD is doing to encourage green building at *www.seattle.gov/dpd/sustainability* or contact:

Lynne Barker, DPD
Sustainable Development Planner
lynne.barker@seattle.gov
(206) 684-0806